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journal homepage: www.elsevier.com/locate/jfecExploring the sources of default clustering^{☆☆☆}S Azizpour^a, K. Giesecke^b, G. Schwenkler^{c,*}^a Apollo Global Management, 9 West 57th Street, New York, NY 10019, United States^b Department of Management Science & Engineering, Stanford University, 475 Via Ortega, Stanford, CA 94305, United States^c Department of Finance, Boston University Questrom School of Business, 595 Commonwealth Ave, Boston, MA 02215, United States

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ABSTRACT

We study the sources of corporate default clustering in the United States. We reject the hypothesis that firms' default times are correlated only because their conditional default rates depend on observable and latent systematic factors. By contrast, we find strong evidence that contagion, through which the default by one firm has a direct impact on the health of other firms, is a significant clustering source. The amount of clustering that cannot be explained by contagion and firms' exposure to observable and latent systematic factors is insignificant. Our results have important implications for the pricing and management of correlated default risk.

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1. Introduction

The US economy has repeatedly suffered significant clusters of corporate default events. Examples include the savings and loan crisis of the early 1990s, the burst of the dotcom bubble in 2001, and the financial crisis of 2007–2009. Fig. 1, which shows the annual number of defaults of US industrial and financial firms with Moody's rated debt between 1970 and 2012, illustrates these events. This paper analyzes the potential sources of the clusters observed in the default timing data. An understanding of these sources is crucial for the measurement of portfolio credit risk at financial institutions, the management of systemic financial risk, as well as the risk analysis and valuation of securities exposed to correlated default risk, such as collateralized debt obligations.

A major source of default clustering is the joint exposure of firms to common or correlated risk factors such as interest rates, stock returns, and GDP growth. The movements of these factors cause correlated changes

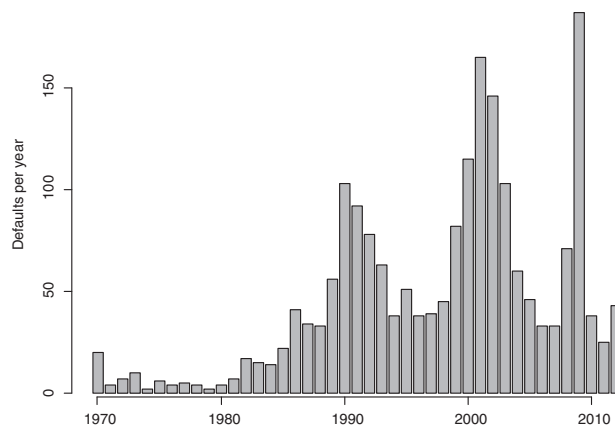


Fig. 1. Annual number of defaults of US firms with Moody's rated debt. Source: Moody's Default Risk Service.

in firms' conditional default rates. For example, strong economic growth often reduces the likelihood of default across the board. In an important paper, however, Das et al. (2007) provide strong evidence that this channel on its own cannot explain the degree of clustering observed in US industrial defaults between 1979 and 2004. The evidence suggests that there are additional sources of default clustering beyond firms' joint exposure to systematic factors. Using data on US industrial and financial default timing between 1970 and 2012, we test whether contagion, by which the default by one firm has a direct impact on the health of other firms, is a source of default clustering. We find strong evidence that contagion is a statistically and economically significant source of default clustering, after controlling for firms' joint exposure to observable and latent systematic factors.

The case for contagion as a potential source of clustering is easily made. Financial, legal, or business relationships between firms might act as a conduit for the spread of risk. For instance, a default by the protection seller in a credit swap could expose the buyer of protection and increase the default risk borne by the protection buyer's other counterparties (see Stulz, 2010). A related example is the collapse of Lehman Brothers in 2008, which pushed some of Lehman's creditors, trading partners, and clients into financial distress (see Aragon and Strahan, 2012; Brunnermeier, 2009; Chakrabarty and Zhang, 2012; Dumontaux and Pop, 2013; Fernando et al., 2012, and others). Contagion is not limited to the financial sector. For example, the default by major parts supplier Delphi in 2005 exposed General Motors, as indicated by a jump in GM's stock price and credit swap spreads. Bams et al. (2016), Boone and Ivanov (2012), Jorion and Zhang (2009), and Lang and Stulz (1992) provide evidence of default spillover effects on business partners. With contagion, the default by one firm can have a direct impact on the conditional default rates of other firms, as in the network models of Acemoglu et al. (2015), Eisenberg and Noe (2001), and Elliott et al. (2014). This impact causes correlation between firms' conditional default rates beyond the correlation due to firms' joint exposure to systematic factors.

To explore the role of contagion for default clustering, we propose a new reduced-form model of correlated

default timing. The model addresses firms' exposure to observable systematic factors, a latent systematic factor, and failure events. The conditional rate of defaults is allowed to depend on time-varying factors that are observable throughout the sample period, a latent frailty factor with square-root dynamics that is not observable at all, and past failures. A default event ramps up the conditional arrival rate in a self-exciting way, representing a contagion effect.¹ The impact depends on the amount of defaulted debt and decays with time. Our model extends the standard doubly stochastic formulation widely used in theoretical and empirical analyses of correlated default risk.² In a doubly stochastic formulation, default arrivals are assumed to be conditionally Poisson given the paths of the observable risk factors, and the only potential source of default clustering is firms' joint exposure to these factors. Our model also extends the richer formulation of Duffie et al. (2009) with observable factors and a latent frailty factor, in which arrivals are assumed to be conditionally Poisson given the paths of all factors. The doubly stochastic assumption imposes strong restrictions on the conditional distribution of events since it precludes a direct influence of past failures on the conditional default rate. Because we do not make the doubly stochastic assumption, we avoid such restrictions. By allowing the conditional default rate to depend on past failures, our model of correlated default risk generates a much richer set of distributions.

We use our model to test several hypotheses regarding the role of contagion for default clustering. We first establish the presence of excess clustering in the default data that cannot be explained by firms' joint exposure to observable and latent systematic factors. This closes an important gap in the literature. Das et al. (2007) find that

¹ Self-exciting models that allow for the dependence of the conditional event rate on past events have been used by Ait-Sahalia et al. (2015) for analyzing the dynamics of asset returns with feedback jumps, by Bowsher (2007) for studying the dynamics of order book data, and by Jarrow and Yu (2001); Berndt et al. (2010), and others for pricing corporate bonds and credit derivatives. In contrast to these prior studies, we also model and estimate the dependence of the conditional event rate on a latent, dynamically varying frailty factor.

² See, for example, Chava and Jarrow (2004), Duffie and Garleanu (2001), Duffie et al. (2007), Jarrow et al. (2005), and Mortensen (2006).

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